THE EXAMINATION OF KINOS AS AN AID IN THE DIAGNOSIS OF EUCALYPTS.

PART II.—THE GUMMY GROUP.

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In Part I. (this Journal, p. 605), I showed that Eucalyptus Kinos entirely soluble in both water and alcohol belong to the Renantheræ, with but one exception. All such Kinos, with certain members of a group yet to be described, satisfy the requirements of the "British Pharmacopœia" in regard to Kino,* and the importation of a single ounce of that drug is unnecessary.

I mentioned in that paper that certain Kinos while readily soluble in water, are very imperfectly soluble in alcohol, owing to the gum they contain. I ventured to call such Kinos the "Gummy" group, which if not elegant is a characteristic designation, as in all other Kinos gum is absent.

Up to the present, I find that the following Eucalyptus Kinos belong to this group:—

1. *E. siderophloia*, Benth.
2. *E. paniculata*, Sm.
3. *E. crebra*, F.v.M.
4. *E. leucoxylon*, F.v.M. (Syn. *E. sideroxylon*, A. Cunn.)
5. *E. resinifera*, Sm.
6. *E. robusta*, Sm.
7. *E. saligna*, Sm.

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* See papers by the author on this subject, *Pharm. Journ.* [3]. xx. 221, 321.

It is interesting to observe that the first four on the list are "Ironbarks,"—a very natural group. In what relation do the other three species stand to this group and to each other? Following is Bentham's classification of the seven species :—

HETEROSTEMONES		*leucoxylon.*
		paniculata.
PORANTHERÆ		*siderophloia.*
MICRANTHERÆ		*siderophloia.*
		crebra.
NORMALES.	(*Robustæ*)	*robusta.*
	(*Subexsertæ*)	*saligna.*
		resinifera.

In the above classification the Ironbarks are spread over two, or three, series.

In Mueller's anthereal classification the Ironbarks are spread over two groups, while in the same author's cortical system they naturally come together in Schizophloiæ.* Also, in Bentham's classification, *E. resinifera*, *E. robusta* and *E. saligna* come together under the Normales, and likewise under the Baron's Parallel-antheræ, but they are separated in the cortical system, *E. saligna* falling under Leiophloiæ, and *E. robusta* and *E. resinifera* under the Rhytiphloiæ.

It is interesting to find that the undoubted affinities of the Ironbarks extend to their Kinos, and that the affinities of *E. robusta*, *E. resinifera*, and *E. saligna* as regards their anthers (especially strong between the latter two), receive collateral proof in regard to their Kinos. The affinities of *E. robusta* and *E. resinifera* are also referred to in Decade VII of Mueller's *Eucalyptographia ; E. punctata* Kino contains no gum (falling in the Turbid group); this emphasises the undoubted difference between *E. resinifera* and that species.

Mem. : *E. robusta*, *E. saligna*, and *E. resinifera* all have red timbers, which is an affinity, shared, however, with other species.

* The Schizophloiæ is not, however, a *perfect* classification. I have seen bark of *E. stellulata*, for instance, which cannot be distinguished from what are generally known as "Ironbarks."

Much yet remains to be done in regard to the classification of the Eucalypts. We have the anthereal systems of Mueller and Bentham, which have been modified by the former botanist, and the cortical system of Baron Mueller. But unfortunately their usefulness is limited, since they do not sufficiently break down this very large genus. No classification yet suggested is entirely satisfactory, through no fault of their authors. My "Kino system" is an aid in this work of scientific classification, and, as I have worked at all the authentic material I can obtain, I publish it, even in its incomplete state, in order to awaken the interest of botanists in the matter, as the accumulation of the necessary material is beyond the opportunities of one institution or of one individual, even in a life-time. I am sanguine that, by combining the three systems (and perhaps others to be formed), a series of tables to aid in the diagnosis of Eucalypts will in the future be constructed, whose precision will be comparable with that of a chemical table for discriminating the metals.

The great drawback to the classifications hitherto propounded (and I by no means make any extravagant claims for my undeveloped system at this early stage), is that they are not *natural*, that is to say they sometimes bring into juxtaposition plants which have no strong affinities (as far as we know), and the reverse. Bentham (B.Fl. iii. 186) was alive to the value of a natural system, though he felt that the time had not then arrived for making it. "In the meantime," said he, "as far as I can gather from the information supplied, it appears to me that among large trees, the majority of the Stringybarks are to be found in my first series with reniform anthers, and of the Ironbarks and Box-trees in the following three series." . . . I have already fragmentarily alluded to this point.

Characteristic of the Gummy Group.—The one characteristic is the presence of gum, a very simple matter to determine. This

is the group of Kinos to be avoided by the pharmacist, since each member (as far as they have been examined), contains between 30 and 40 per cent of gum. They tend to be perfectly soluble in cold water, and age seems to have comparatively little effect on them in this respect.

The matter of the uselessness of Kinos of this group for the preparation of tinctures is of such importance to every medical man and pharmacist in Australia, that I make no apology for quoting portion of a recent paper by myself in the *Pharm. Journ.* of Great Britain.

"It has been stated that Botany Bay Kino has been procured principally from this species *(E. siderophloia)*. But what are the characteristics of Kino? The official Kino *(Pterocarpus Marsupium)*, is, according to the British Pharmacopœia of 1885, 'almost entirely soluble in rectified spirit.' This is an important property, and on it the Tinct. Kino B.P. is based. Works on Materia Medica, while pointing out certain unimportant points of dissimilarity between the official and Eucalyptus Kino, never state that the latter does not dissolve in rectified spirit, while some make the specific statement that it is soluble in that liquid. But my experiments have shown that no Kino is more insoluble in spirti than that of *E. siderophloia!* . . . The Kino of *E. resinifera*, Smith, is also comparatively little soluble in spirit, for a similar reason. For this reason alone, I do not hesitate to say that 'Botany Bay Kino' is neither the produce of *E. siderophloia*, Benth., (*E. resinifera*, Smith), nor *E. resinifera*, A. Cunn. Both these Kinos would be quite useless for the preparation of the tincture, and would never be thought of a second time by any person who had made the experiment on either; it is therefore quite certain that these species have not caused pharmacists to use Eucalyptus Kinos more or less for a century, but rather, it has doubtless been the admixture of such Kinos as these with such Eucalyptus Kinos as are freely soluble in spirit, which has helped to bring Eucalyptus Kino into disrepute."

When the Ironbark Kinos are of the same age, I doubt whether they can be distinguished from each other. They darken with age, like other Kinos, colour being with Kinos often simply comparative. They are bright looking, and often with an almost greasy lustre, are obtainable in large pieces, for their tenacity is such (owing to the gum they contain), that they do not easily break into small pieces like the Ruby Kinos,—much less do they break into powder like the members of the Turbid Group. They stick to the teeth if chewed.

Following is a detailed account of such of the "Gummy" Kinos as have fallen into my hands, up to the present. I reserve the publication of an exhaustive analysis of a typical Kino of each of the groups for another occasion.

In the case of *E. siderophloia*, I have described several Kinos of different ages, the object being (as in the Ruby Group), to show the variability in appearance, and the range of variability of composition.

EUCALYPTUS CREBRA, F.v.M., B.Fl. iii. 221.

"Narrow-leaved Ironbark," though, as Dr. Woolls has pointed out, there is a narrow-leaved form of *E. paniculata*, for which this species may be mistaken. Extends from N. S. Wales to Northern Australia.

No. 25. I am indebted to Mr. R. T. Baker for this sample; he obtained it 7th Oct. 1889, at St. Mary's, South Creek, N. S. Wales.

It cannot be distinguished in outward appearance from that of *E. siderophloia* (No. 31) below.

EUCALYPTUS LEUCOXYLON, F.v.M. (Syn. *E. sideroxylon*, A. Cunn. B.Fl. iii. 209.)

Found in N. S. Wales and Queensland.

Dr. Wiesner (*loc. cit.*), says of this Kino, "Same reaction as *E. globulus*.* Large black-red lumps, with fibrous impurities."

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* I have not yet been able to obtain Kino of this species, so I am unable to criticise the comparison.

Sometimes the bark of this tree is honeycombed, the cavities being filled with Kino. The blackish Kino, set in rows, in the light reddish-brown bark, has a beaded granular appearance, characteristic, perhaps, of this species.

No. 26. "Ironbark." Received from the Botanic Gardens, Sydney, 29th December, 1887.

This sample is in large masses, from which the firmly adherent wood and bark have to be cut away. It is of horny appearance, and shows something of that texture when cut with a knife. It is opaque-looking, except at fresh fractures. The Kino appears almost black, and it is only at the edges of thin splinters that it is observed to be of a deep garnet colour. It powders with difficulty, forming a powder much like Indian red.

Cold water yields a deep orange-brown solution, leaving a residue consisting of phlobaphene and shavings of bark. The process of solution goes on very slowly. Colour of residue Sienna brown.

EUCALYPTUS PANICULATA, *Sm.*, B.Fl. iii. 211-212.

Found in N. S. Wales, the S. Australian and Victorian species being probably different.

No. 27. "She Ironbark;" North Ryde, 28th April, 1888. Diam. 1 ft. 6 in.; height, 60 ft.

The tree which yielded this particular sample yielded it in unusual abundance. Not only have I never seen a tree of this species yield it in such quantity, but in abundance it rivalled the quantity exuded by an *E. corymbosa* tree in full bearing of Kino. The rugged bark was covered with a mass of long tears, and samples of great purity could readily be obtained. When collected, this Kino resembled orange lac in appearance to a marked degree, though some fragments varied in tint to brown and garnet lac. In all cases the resinous appearance of the Kino is strikingly similar to lac. It is fairly brittle, and forms a bright powder.

It dissolves readily in cold water, forming a very pale-coloured solution of an orange-brown colour. Colour of residue Vandyke brown.

EUCALYPTUS RESINIFERA, Smith, B.Fl. iii. 245.

Found in N. S. Wales and Queensland.

"The specific gravity of this Kino is about 1·416 and the percentage of tannin 65·57 (*sic*)" (Staiger).

Dr. Joseph Bancroft quotes another analysis by Mr. Staiger of this Kino, in which he found 54 per cent. of Kino-tannic acid, and "also a kind of gum-arabic, but in older samples the amount of Kino-tannic acid is greater, and the gum less." I have no particulars of the above Kinos, so I am unable to say how far Mr. Staiger's analyses and my own are reconcileable.

In the Catalogue of the Museum of the Pharmaceutical Society of Great Britain (p. 46), a Kino called *E. resinifera*, Lin. (a misprint probably for Cunn., and therefore the species would be *E. siderophloia*), is catalogued, and the statement is made that "This gum may be recognized by its reddish tint and powdery surface." Neither of the Kinos of the two *E. resiniferas* answers to this description ; such a Kino would probably be allied to *E. rostrata* (a member of the Turbid group).

No. 28. "Mahogany." Received from the Government Botanist of Queensland (Mr. F. M. Bailey), February, 1888.

In smallish tears for the most part, showing firmly adherent wood or bark on one side. A clear-looking Kino of a dark colour, showing a dark ruby colour by transmitted light. It has evidently been collected for a long time. It is inclined to be tough and horny, and is therefore rather difficult to powder. Fracture bright. Colour of powder of a pure burnt Sienna.

Cold water forms a deep orange-brown coloured liquid, which thins out to a bright orange-brown colour. Colour of residue Vandyke brown.

With alcohol (so as to form a tincture of B.P. tinct. Kino strength), the supernatant liquid is of a reddish-brown colour, and the granular residue is of a reddish-brown colour likewise.

EUCALYPTUS ROBUSTA, Smith, B.Fl. iii. 228.

Found in N. S. Wales and Queensland.

Note.—Smith, in describing this species in his *Specimen of the Botany of New South Wales*, 1793, styled it the "Brown Gum-tree" or "New Holland Mahogany." The first name was given because "its resin is an inferior sort of red gum, of a brown hue." Smith's Kino was brownish because it was old, and I draw attention to the name "Brown Gum," which is sometimes quoted in connection with this species, in order to point out that it is never employed in Australia, and was simply Smith's appellation.

No. 29. "Swamp Mahogany." Bolong Swamp, Nowra, August 1888. Diam., 1-5 ft.; height, 60-100 ft. A poor sample. In tears with adherent fibrous bark. The tears are quite bright, and therefore freshly exuded, presumably. It is of a more than ordinarily rich deep ruby colour.

Cold water yields a solution of a medium orange-brown colour, and leaves a reddish-brown residue. With alcohol (tinct. B.P. strength), the liquid is but slightly coloured; the granular gummy residue is rendered opaque-looking, and of tints from flesh colour (gum), to Vandyke brown (phlobaphenes).

EUCALYPTUS SALIGNA, Smith, B.Fl. iii. 245.

Found in N. S. Wales and Queensland.

No. 30. "Blue Gum." Eastwood, near Sydney, 28th April, 1888. Height, 80 ft.; diam., 3 ft.

A dullish-looking Kino, of all tints of garnet. It is of a horny texture for the most part. In bulk it perhaps most generally resembles *E. punctata* Kino in appearance, but it has none of the brown tint of the latter.

It readily dissolves in cold water, forming a quite clear liquid of a dark orange-brown colour, with a small amount of residue of a Vandyke brown colour. Alcohol (B.P. strength of tincture) yields a reddish-brown liquid, and leaves a granular residue of a dark reddish-brown colour.

EUCALYPTUS SIDEROPHLOIA, Benth. (Syn. *E. resinifera*, A. Cunn., *non* Smith), B.Fl. iii. 220.

Found in N. S. Wales and Queensland.

"The specific gravity of this Kino is about 1·413, and the percentage of tannic 72·13" (Staiger). I regret that I cannot accept this percentage of tannic acid.

Dr. Joseph Bancroft of Brisbane describes this Kino as exuding plentifully, and at first being in long tears of a pale yellowish colour, which darken into bright red, and eventually into black, becoming more insoluble. (I can endorse this description from examination of New South Wales specimens). He states that a tincture made with $2\frac{1}{2}$ ounces to a pint of proof spirit is valuable as an astringent in diarrhœa, but gelatinizes on keeping. I have already pointed out that Kino of this species is little soluble in spirit owing to the gum it contains.

No. 31. "Ironbark." Cambewarra, 12th August, 1886. Height, 80-100 ft.; diam., 4 ft.

Obviously newer than the two succeeding Kinos. It is of a rich ruby colour, both by reflected and transmitted light. It is mostly in tears, rather horny, and therefore difficult to powder. Colour of powder Sienna brown.

It dissolves in cold water almost entirely, forming a medium orange-brown liquid. The residue consists of reddish phlobaphene, with a trace of accidental impurity. Colour of residue umber brown. With alcohol (strength of B.P. tinct. Kino), a pale sherry-coloured liquid is formed. The insoluble residue collects into rounded pieces, swells up slightly, and does not disintegrate with

shaking the bottle. It reminds one irresistibly of potted lobster. When rubbed gently with a glass rod the lumps disintegrate, and the interior of them is found to be of a salmon colour. On evaporation of the spirit the masses shrink in bulk, become of a darker colour (though far lighter than the original Kino), and extremely brittle.

No. 32. "Broad-leaved or Red Ironbark." Richmond, N. S Wales, July, 1886. Given to me by the Rev. Dr. Woolls.

In masses of a pure reddish-brown to ruby, and almost transparent. Woody matter is finely adherent to the outside of the masses. Rather difficult to powder as it feels gummy.

With cold water and alcohol it behaves in exactly the same way and possesses the same appearance as the preceding specimen. Colour of residue umber brown.

No. 33. "Ironbark." Queensland. Received from Mr. F. M. Bailey, Government Botanist of that colony, February 1888.

This sample must have been collected for a considerable period. It is black and dull looking, and quite horny in texture. The ruby colour is apparent if very thin splints be taken. Some wood or bark is firmly adherent. It is exceedingly difficult to powder. Colour of powder dark Sienna brown.

With cold water the solution is much darker than that with the other samples of this species. It is of a deep orange-brown colour. Colour of residue brown to Vandyke brown. Alcohol appears to have but little effect on this Kino.

No. 34. "Ironbark." Cambewarra, 25th September, 1888. Height, 60-80 ft.; diam., 2 ft.

A quite freshly exuded Kino. It is of a pale orange colour, and in tears of considerable size. Fracture dull resinous; gummy to the feel. The description of *E. paniculata* (Ryde), applies to this sample.

Cold water yields a very pale orange-brown solution, with a rose tint. Alcohol (B.P. strength of tincture), yields an almost colourless solution. The gummy granular residue is flesh-coloured.

GUMMY GROUP.

PERCENTAGE OF THE FOLLOWING CONSTITUENTS.

No.	Name.	Kino-tannic Acid.	Insoluble Phlobaphenes.	Gum.	Ash.
25	*Eucalyptus crebra*, F.v.M.	37·99	trace	40·42	·2
26	*E. leucoxylon*, F.v.M.	32·51	5·1	34·2	·1
27	*E. paniculata*, Sm.	34·74	2·9	34·9	·2
28	*E. resinifera*, Sm.	39·62	2·0	32·1	·1
29	*E. robusta*, Sm.	35·05	3·7	31·4	·2
30	*E. saligna*, Sm.	35·56	4·6	31·3	·2
31	*E. siderophloia*, Benth.	36·07	1·6	33·7	·1
32	Ditto	35·1	1·2	38·1	·1
33	Ditto	33·02	2·2	39·0	·4
34	Ditto	37·08	trace	34·1	·1